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**BEFORE THE ARIZONA CORPORATION COMMISSION**

Docket Control
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007



**COMMISSIONERS**
**TOM FORESE, CHAIR**
**BOB BURNS**
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**ANDY TOBIN**



Docket No. E-01345A-16-0036
Docket No. E-01345A-16-0123

**The Safer Utilities Network comments in opposition to the Arizona Public Service Settlement agreement.**

## 1. Introduction

Our organization is based near Snowflake, Arizona, in a community of people with severe and disabling environmental sensitivities. Members of our community literally had to flee the cities and settle in a rural area of the high desert to get away from the pollution, including electropollution.

Here we have built specially designed houses to accommodate our disabilities. The houses are built of non-toxic materials and most also have features that lower the electromagnetic radiation. People have done the same in other parts of Arizona as well.

These houses cost much more to build than a regularly constructed house. If we are forced to move away, these houses would have to be sold on the regular real estate market at a steep loss.

In 2008, the State of Arizona's Department of Housing built four houses here to our specifications, to be rented to people with environmental disabilities. The rent is subsidized to help people with these disabilities who are otherwise unable to afford buying or renting such a house.

In 2011, we heard that Arizona Public Service had begun installing wireless electrical meters in Arizona. We were able to arrange two meetings with APS to express our need to avoid their smart meters. This resulted in APS voluntarily creating the opt-out program that is still in place.

The APS opt-out program has worked very well, but we have grave reservations about the proposed changes, especially that the analog meters will be replaced with digital meters.

**2. The problem with digital meters**

All digital meters contain electronics inside. Only the traditional mechanical analog meters can function without electronic components.

The electronics in a digital meter must be powered by direct current (DC) electricity at a much lower voltage than the 120/240 volt AC supplied to the house (typically 5 volts DC). To do that, some sort of power supply is necessary. The most common type of power supply used in small electronics is a switching power supply. It works by rapidly switching the electrical current on and off (typically around 50,000 times a second, but it can be much more rapid).

An unintended side effect is that this "switching" places abrupt voltage fluctuations on the wires in the house, called "transients" or "dirty electricity." This turns the household wiring into large antennas, radiating radio-frequency signals from all walls of a house.

Dirty electricity can cause subtle symptoms, such as irritability and problems with sleep and attention. It is difficult for many people to identify the cause, since they are exposed to dirty electricity from many sources wherever they are, including home, school, office and car.

People with electrical sensitivities can be more strongly affected by dirty electricity and have to limit their use of many items that contain switching power supplies, such as televisions, computers, battery chargers, low-energy lightbulbs and grid-powered clocks. Since digital meters cannot be turned off, they are a hardship imposed on a vulnerable part of the population.

**3. The analog meters**

The standard mechanical analog meters do not contain any electronics and thus no switching power supplies or dirty electricity. These meters work well for most sensitive people and continue to be the best technology for the opt-out meters.

An extra benefit of the analog technology is that it is visibly different from the digital meters. Customers can easily verify that it is not a digital meter, and thus be assured that the meter has not been changed to something more harmful, such as a wireless meter. All the digital meters look so similar that an average customer is not able to tell a wireless from a non-wireless model, or a model producing a lot of dirty electricity from one that doesn't. The digital meters will thus always be a source of suspicion and uncertainty.

The traditional analog meters are more robust, reliable and accurate than the digital meters. The typical life span of an analog meter is 30 years. APS claims their digital meters have an expected life span of 20 years, but that seems to be wildly optimistic since actual experience contradicts this claim. APS itself had to replace tens of thousands of its digital meters and Navapache co-op is in the process of replacing all of its 40,000 meters. The APS meters lasted five to six years, the Navapache meters just three years. (Source: Warren Woodward, who used his Intervenor status to get this information.)

Digital meters of all kinds are vulnerable to damage from voltage spikes and powerful electromagnetic pulses (either caused by nature or certain weapons). The analog meters are impervious to these threats.

The analog meters are presently read monthly by someone taking a picture of the dial without even leaving the vehicle. The new digital meters require the meter reader to walk up to the meter and insert a "wand" into a socket to download the data. This hardly seems like a more efficient method, even though the back-office processing is simpler. It must be really important to APS to get the much more detailed information on how people use electricity that the digital meters provide –

historical information that is not necessary to provide electrical service, but is valuable for marketing purposes.

**4. Technical solutions**

There are technical solutions that could allow APS to use digital meters without causing harm. In 2011, we pointed those out directly to APS and in a filing to the Corporation Commission.

Our main suggestion was for APS to compel their meter vendor to improve their designs so their products minimize the dirty electricity.

There are several options available which might cost nothing, or just add a dollar or two to mass-produced meters:

- Capacitor as dropping element to a linear regulator
- Capacitor as dropping element to a secondary switching power supply
- Choosing a low-EMI switching design
- Filter between mains and power supply
- Small transformer inside housing

The above options can be used in combination.

Design changes take time, but we pointed this out to APS six years ago.

In order for us to accept a digital meter, we would need technical information on the meter's EMC profile. Since APS has a rather rapid turnover of their meter models, we would also need APS to guarantee that future opt-out meters are made to the same standard so customers can trust them.

Until such time, APS must continue to supply the analog meters. This should be entirely feasible, since APS told us in 2011 that they would start storing the meters they removed from homes they converted to their smart meters. At that point, they had nearly a million homes left to convert.

**5. Impact on Customers**

If APS persists and installs their digital meters, the impact on highly sensitive customers can be severe.

Since APS is a monopoly, there is no option to switch to another utility. Five homes in our rural community are now off the grid with low-radiation solar systems. Regular solar systems have the same problem with transients (dirty electricity) as other electronics, but these solar systems were specially designed to solve this problem. (Four are inverterless DC-only systems, the fifth uses costly filtering and shielding.)

Taking a house off the grid is not possible for everyone. It can be very costly to convert an existing house and many people do not have the practical ability to operate such a system. This is especially the case with elderly and disabled people.

One grid-tied home we looked at would cost an estimated $30,000 to take off the grid. The biggest cost was to install a totally new heating system with a propane burner located outside, in a way that no combustion gases could enter the house, since the owner also has severe chemical sensitivities. Another major cost was to convert the well to solar power. The owner of the house is elderly and fully disabled. She lives on $755/month Social Security with no ability to shoulder any major cost. She also does not have the technical skills to operate such a system.

Mitigating the impact of having a digital meter on a house may not be realistic. There are simple low-cost plug-in "filters" available, but they have a spotty record as they are not true filters. Their only active component is a capacitor, which incidentally creates lower frequency harmonics (as documented in a 2006 study by Greg Gajda et al. at Health Canada). These can cause problems for some sensitive people. The capacitors also create an imbalance in the voltage-current ("reactive power"), which APS presumably wants to avoid.

Another issue is that the trend for switching power supplies is to run at higher frequencies. Future digital meters may use these technologies. The simple plug-in "filters" are useless at switching frequencies above about 100 kHz.

Truly effective filters include at least one coil. Since it is not possible for a customer to install a filter inside the meter housing (to just filter the electronics), a customer-installed filter will have to carry the full current to the household.

A coil capable of filtering the frequency band down to about 10 kHz, and carrying a current of 100 amps, will be large and costly to buy. It will also be costly to operate, since a lot of electricity will be lost as heat.

As any good engineer knows, removing the source of the problem is generally the cheapest and most effective solution.

Stop-gap options include replacing the household wiring with shielded cables or removing power from a part of the house and simply avoiding the rest of the house. Neither of these are really effective or acceptable measures.

The impact on people sensitive to the dirty electricity is totally out of proportion to the minor gains perceived by APS.

**6. Fees**

APS instigated its smart meter program solely for financial gain. There is a principle of letting the polluter pay that should apply here. Asking people to pay to avoid harm is similar to a business polluting ground water and then charging the victims for bottled water.

**7. Grid-tied customers**

Grid-interactive solar systems are not suitable for very sensitive people, due to the dirty electricity from the inverter. However, the Safer Utilities Network supports those people who have such a system and do not wish to have the additional radiation burden and privacy intrusion of a smart meter.

The analog meters have been used for this purpose for decades and APS has not presented any compelling reason to force smart meters upon anyone.

**8. Conclusion**

As demonstrated, the impact of APS' intended replacement of the existing analog meters with new digital meters can be totally out of proportion to what perceived gains APS may enjoy. (Gains that are questioned in detail in the April 3rd 2017 filing by Intervenor Warren Woodward.)

All burdens will be carried by some of society's least fortunate people, who are disabled and usually have to live on a meager disability pension. APS' intents are unjust and discriminatory.

It is possible to design digital meters that are harmless, but there is a problem with verification, trust, and the possibility of future upgrades that are not acceptable.

The analog meters have the benefit of being proven and reliable technology that any customer can visibly verify is the safe design they need.

The digital meters will always be suspect. Even if APS were to use benign digital meters now, they may "forget" to do so when they become obsolete a few years later. Customers may not notice the change and be unable to determine the cause of their worsened symptoms.

Many people have difficulty even locating the model number on their meter, while most can easily identify an analog meter.

If customers successfully used the plug-in "filters" for the old meter, they may not help with a new meter.

This has been a long and difficult process. We should not leave such an important issue for the future, but resolve it now, once and for all.

We ask the Arizona Corporation Commission to:

> Require APS to provide analog meters to anyone, and not allow APS to force people to use digital meters.
>
> Allow grid-tie solar customers to refuse a smart meter.
>
> Not allow any opt-out fees. The polluter should pay, not the victim.

Respectfully submitted, May 12, 2017 by:

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